

worked out. Where required, the exercise is explained by means of a diagram. It is recognised that certain preliminaries are required to enable the student to understand electrical problems, and, to this end, the earlier questions relate purely to mechanics, hydrostatics, and heat. The examples are very varied in type, and include cases of interest, both theoretically and practically. There follows a short section in which the various mechanical, thermal, and electrical units are defined, and the book concludes with numerous tables, in which these units are collected, together with others giving the values of the various physical constants required in the working of the exercises.

It is somewhat doubtful whether the procedure of asking a question and at once giving the answer can be of much benefit to a student. It surely tends to discourage the use of the student's own initiative. A few illustrative worked examples should suffice, the rest being left for the learner to undertake.

The book is well printed, but it may be mentioned that some six of the introductory pages are missing from the copy submitted to the reviewer; it is to be hoped that this mistake does not extend to the whole edition.

(2) The second edition of this excellent treatise on electricity and magnetism, by Prof. Starke, has been brought thoroughly up to date by the addition of numerous paragraphs and chapters. Besides all the experimental and theoretical considerations usually found in text-books on this subject, many special electrical applications are dealt with at length. Particular attention is given to the production and properties of electro-magnetic waves and to the practical uses of the latter in wireless telegraphy and telephony. As indicated in the title, the electro-magnetic theory of light is also dealt with, especially the explanations of the various optical phenomena upon the electron theory. In the thirteenth chapter this theory is extended to thermal and electrical conduction, and to the different thermo-electric effects. The section devoted to the conduction of electricity in gases has been largely added to, so that most of the latest work in this department of physics is considered. The new chapter on radio-activity gives a brief general outline of the rapidly progressing work which has been done in this direction, and includes a table giving the various radio-active substances at present known, their life-periods, types of rays, and physical properties. Finally, the author devotes an appendix of considerable length to the theory of moving electrons and the principle of relativity.

In every respect this book has claims to be regarded as a standard work on electro-magnetism. The alterations and additions in this edition have brought it, as far as possible in a general text-book, to the level of modern scientific research. To all those desirous of becoming acquainted with the present state of knowledge in this subject it can therefore be thoroughly recommended. It may also be mentioned that the type, diagrams, and paper are excellent.

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#### CELLULOSE EPHEMERIDES.

*Literatur der Zellstoff- und Papier-Chemie und der Papier-Technik im Jahre 1909.* In Auszügen dargestellt. By Prof. C. G. Schwalbe and A. Lutz. Pp. 158+xix+94. (Berlin: Gebrüder Borntraeger, 1911.) Price 5 marks.

*Zur Kenntnis der Cellulosearten.* By Dr. W. Schulz. Nebst einem Vorwort, by Prof. C. G. Schwalbe. Pp. vi+100. (Berlin: Gebrüder Borntraeger, 1911.) Price 3.20 marks.

THESE publications are indicative of the extraordinary specialisation of cellulose chemistry, and at the same time of a tendency to intensive elaboration of detail in investigation, and more particularly of records, which, however interesting to the specialist, are drawn in too narrow a perspective to rank in the general literature of the science.

The former is a bibliographical record, sufficiently defined by its title. It is produced under the auspices of a youthful technical society, the "Verein der Zellstoff- und Papier-Chemiker," which is doing much useful work, and very fully justifying its foundation and existence. The matter of the volume is exhaustive, the records take the form of abstracts, which are duly concentrated and presented under a well-considered scheme of classification, with full indexes.

The second volume is a record of research towards establishing a method of diagnosing the more important industrial celluloses in terms of differentiating factors. This work is evidently inspired by Prof. C. G. Schwalbe, and in a short preface he claims for the author's results at least a definite promise of achievement, a claim which is somewhat at variance with the conclusions recorded *en résumé* on pp. 85-86, 99-100; these are rather of negative import.

The main scheme of investigation is a study of acid hydrolysis, taking as a measure of the degree of hydrolysis the reactions of the products with alkaline cupric oxide (Fehling's solution), and as a first stage (a) combination in the cold with cupric oxide (hydrate), and secondly (b) reduction to cupric oxide, on boiling.

The quantitative determinations are recorded under a special nomenclature, thus:—"Cellulosezahlen" (a) "Korrigierte Kupferzahlen" (b-a); and after the particular hydrolytic treatment "Hydrolysierzahl" (b') and "Korrigierte Hydrolysierzahl" (b'-a').

The numbers recorded for a selection of ten typical marks of sulphite celluloses are, as the author admits (*loc. cit.*), unconvincing. An *a priori* consideration of the method would, we think, have enabled the author to predict the generally inconclusive result. It has been long established that the hydrolytic resolutions of cellulose can proceed very far under the action both of acids and alkalis without liberating CO groups. It is clear therefore that cupric reduction is only a partial measure of cellulose hydrolysis. And generally oxidations by alkaline cupric oxide are highly complex reactions, even the classical reactions with the sugars are by no means well defined, and remain therefore of essentially empirical order. Without detracting in any way from the author's results as quantitative observations, we suggest that they

should have been recorded in simple terms, that is, without the adventitious aid of a special nomenclature, which merely obscures their significance.

A more important section is that devoted to a careful study of the supposed total hydrolysis of cellulose to hexose groups, and the implied problem of fundamental constitutional import. The author rightly recognises that the experimental verifications of the view that "cellulose is a polyhexose anhydride," are wholly defective; indeed, with progress in investigation the actual yields of sugars or their immediate derivatives obtained from (cotton) cellulose are extremely variable and generally much below the statements of the earlier observers, Braconnot, Béchamp, Flechsig.

The later investigations of Ost and Wilkening indicate that the hydrolysis is complicated by the formation of acids of low molecular weight, and their results with the author's present contribution undermine the plausible assumption that cellulose is a close analogue of starch.

In his study of the hydrolysis of the normal cellulose, the author has taken as his starting point the well-known intermediate products obtainable as colloidal hydrates, thus Guignet's "Cellulose Colloide," Flechsig's typical "Amyloid," "Parchmentised Cellulose," and Ekström's so-called "Acid Cellulose." These products, tested in relation to Fehling's solution, and the particular scheme of hydrolysis previously described, gave extremely variable numbers, thus for the "Korr: Hydrolyszahl" 7.3, 26.7, 17.6, 30.4, for the products in the above-named order. Following the section devoted to a careful study of these proximate products, is the complementary section on "Die Abbauendprodukte der Baumwollcellulose und des Sulfitzellstoffs."

From the preface (Schwalbe) we abstract the important result of these laborious observations, which is that the author obtained from cotton cellulose only 40 to 50 per cent. of its weight of the hexose (dextrose), either as such, or calculated from the yield of ozazone, and from sulphite celluloses less than one-half this yield.

This work we commend to the careful study of those who take a special interest in cellulose chemistry. In this case also we can commend the author's minutely detailed record of experimental conditions, which are quite essential. The only criticism we offer is that the work would have been more fruitful if spread over a smaller range of the intermediate products.

The differentiation of these is relatively unimportant. The concentration of the investigation upon the endeavour to account in any one case for the 100 parts of cellulose taken into work, in terms of the final products of hydrolysis, would have furnished a much more valuable and positive contribution to the fundamental problem.

As a further suggestion, the resolution of the acetate or "Acetolysis" of cellulose appears to be more promising of attaining to ultimate hydrolysis, the elimination of OH groups keeping the breakdown of the complex on simpler lines of cleavage (comp. W. Schliemann, *Annalen*, 378, 366, 1911).

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Much work is being done in this direction, and we may expect before long to integrate the contributions from the two directions of experimental study into comprehensive schematic constitutional formulæ for the typical celluloses. We may anticipate from this a new light on "organic" chemistry in the full sense of the term.

#### OUR BOOK SHELF.

*The Law of Sex Determination and its Practical Application.* By Laura A. Calhoun (Mrs. E. E. Calhoun). Pp. 254. (New York: The Eugenics Publishing Co., 1910.) Price 1.50 dollars net.

THE theory suggested in this book is that "the sex of the embryo in man and the higher animals is determined in the ovary from which the ovum in question is developed. In the normal female the ovary of the right side yields ova which on fertilisation develop as males, and the ovary of the left side yields ova which are potentially female." "The writer is not in a position to furnish absolute verification, through methods of anatomy or physiology, of her theory. She has no laboratories nor methods of precision by which her theory can be directly tested. But she is convinced of its truth from her own extensive experience in its practical application for a period of thirty years." She has instructed her friends, and "the results have always verified the law, which during thirty years of observation and testing have never failed."

We shall not give away the ingenuous author's practical recipe, but the general theory is that the right ovary is responsible for the males. This will be good news for those who believe that men are always in the right. "In normal mothers the right ovary always produces ova that, when fertilised, develop as boys. The left ovary always produces ova that, when fertilised, develop as girls. And the mother determines the sex of her child when she consciously or unconsciously directs the fertilising spermatozoa to her right or left ovary." The evidence in support of the theory consists of references to a relatively small number of cases where obedience to the author's practical suggestions was followed by the appearance of a girl or a boy as desired.

A theory similar to the above was brought forward in 1909 by Rumley Dawson, and in dealing with either of them we are met by the difficulty of applying precise experimental tests in the case of man. The experiments of Doncaster and Marshall, reported in the *Journal of Genetics*, November, 1910, show that "in the rat it is not true that ova determining one sex are produced from one ovary, and those determining the opposite sex from the other, for each rat, with one ovary completely removed, produced young of both sexes. This does not, of course, prove that the "right and left ovary hypothesis" is not true for man, but its definite disproof for another mammal detracts from its probability." It may also be recalled that birds have only one ovary.

The book before us is in great part made up of quotations, mostly from sound authorities, such as E. B. Wilson, W. E. Castle, L. Cuénot, and T. H. Morgan. It is a well-intentioned book, but it does not contribute much to the difficult problem discussed.

*New Zealand Plants and their Story.* By Dr. L. Cockayne. Pp. viii+190. (Wellington: John Mackay, 1910.)

FOR some years past it has been Dr. Cockayne's endeavour to arouse amongst the settlers in the Dominion a better knowledge and appreciation of their